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EXAMINER	
KUBELIK, ANNE R	

ART UNIT	PAPER NUMBER
1638	12

DATE MAILED: 06/20/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/901,737	Applicant(s) LEBEL ET AL.	
	Examiner Anne Kubelik	Art Unit 1638	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 March 2002* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *6-9 and 11-29* is/are pending in the application.

4a) Of the above claim(s) *24-29* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *6-9 and 11-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

1. The amendments to claims 6-8, the cancellation of claim 10, and the addition of claims 16-29, requested in Paper No. 9, filed 25 March, 2002, have been entered. Claims 6-9 and 11-29 are pending.

2. Applicant's election without traverse of Group I (claims 6-9 and 11-15), drawn to a plant expressing a cellulase, in Paper No. 9 is acknowledged.

3. Newly submitted claims 24-29 are not directed to the elected invention for the following reasons: The inventions are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different process of using that product (MPEP § 806.05(h)). In the instant case the plants of Group I can be used in multiple methods, including methods of enhancing the digestibility of animal feed, methods of enhancing cellulose degradation, and methods of producing ethanol. The method of claims 24-25, the method of claim 26, and the method of claims 28-29 each have different staring products, different method steps and different end products. The plant of claim 27 is unrelated to the plants of Group I because the plant of claim 27 requires genes encoding different enzymes than are required for the plant of Group I.

Claims 24-29 are withdrawn from consideration as being directed to non-elected inventions. See 37 CFR 1.142(b) and MPEP § 821.03.

Applicant is required to delete non-elected enzymes (*e.g.*, cellobioses, β-D-glucosidase and cellobiohydrolases) from the claims.

Claims 6-9 and 11-23 are examined to the extent they read on cellulases.

4. This application contains sequence disclosures that are encompassed by the definitions for nucleotide and/or amino acid sequences set forth in 37 CFR 1.821(a)(1) and (a)(2). However, this application fails to comply with the requirements of 37 CFR 1.821 through 1.825.

Sequence identifiers are missing from the adaptors on pg 26 and 32 and the primers on pg 39-41 and 46.

Full compliance with the sequence rules is required in response to this Office action. A complete response to this Office action must include both compliance with the sequence rules and a response to the issues detailed in this action. Failure to fully comply with both of these requirements in the time period set for in this Office action will be held to be non-responsive.

5. The drawings are objected to for the reasons indicated on the accompanying form PTO 948. Corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance. See 37 CFR 1.85(a) and MPEP 608.02(b).

6. The title of the invention is not descriptive of the instant invention. A new title is required that is clearly indicative of the invention to which the claims are directed. Note that titles can be up to 500 characters long.

7. The abstract is not descriptive of the instant invention. A new abstract is required that is clearly indicative of the invention to which the claims are directed.

8. Applicant has not complied with one or more conditions for receiving the benefit of an earlier filing date under 35 U.S.C. 119(e) and 120 as follows:

An application in which the benefits of an earlier application are desired must contain a specific reference to the prior application(s) in the first sentence of the specification or in an application data sheet (37 CFR 1.78(a)(2) and (a)(5)).

Claim Rejections - 35 USC § 101

9. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

10. Claims 6, 11, 18 and 21-22 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. The claims are drawn to plants expressing a cellulase and to seeds, which are products of nature.

The plants and seeds, as claimed, have the same characteristics and utility as those found in nature and therefore do not constitute patentable subject matter. See *American Wood v. Fiber Disintegrating Co.*, 90 U.S. 566 (1974), *American Fruit Growers v. Brogdex Co.*, 283 U.S. 2 (1931), *Funk Brothers Seed Co. v. Kalo Inoculant Co.*, 33 U.S. 127 (1948), *Diamond v. Chakrabarty*, 206 USPQ 193 (1980). It is suggested that the claims be modified to refer to the hand of the inventor, *e.g.* by indicating that the plants and seeds are transformed with a nucleic acid encoding the cellulase.

Claim Rejections - 35 USC § 112

11. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

12. Claims 6-9, 11-14 and 16-23 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter that was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The claims are broadly drawn to a multitude of plants expressing cellulases or transformed with DNA molecules that encode cellulases. In contrast, the specification only describes *Thermomonospora fusca* sequences that encode three β-1,4-endoglucanses. The specification does not describe all the other DNA molecules encoding cellulases, as encompassed by the claims, and the structural features that distinguish all such nucleic acids from other nucleic acids are not provided.

Hence, Applicant has not described plants expressing cellulases or transformed with DNA molecules that encode cellulases within the full scope of the claims, and the specification fails to provide an adequate written description of the claimed invention.

Therefore, given the lack of written description in the specification with regard to the structural and physical characteristics of the claimed compositions, it is not clear that Applicant was in possession of the genus claimed at the time this application was filed.

See *Univ. of California v. Eli Lilly*, 119 F.3d 1559, 43 USPQ 2d 1398 (Fed. Cir. 1997):

> The name cDNA is not in itself a written description of that DNA; it conveys no distinguishing information concerning its identity. While the example provides a process for obtaining human insulin-encoding cDNA, there is no further information in the patent pertaining to that cDNA's relevant structural or physical characteristics; in other words, it thus does not describe human insulin cDNA .... Accordingly, the specification does not provide a written description of the invention ....

and at pg 1406:

> a generic statement such as "vertebrate insulin cDNA" or "mammalian insulin cDNA," without more, is not an adequate written description of the genus because it does not distinguish the genus from others, except by function. It does not specifically define any of the genes that fall within its definition. It

> does not define any structural features commonly possessed by members of the genus that distinguish them from others. One skilled in the art therefore cannot, as one can do with a fully described genus, visualize or recognize the identity of the members of the genus. A definition by function, as we have previously indicted, does not suffice to define the genus because it is only an indication of what the genes does, not what it is.

See *Amgen Inc. v. Chugai Pharmaceutical Co. Ltd.*, 18 USPQ 2d 1016 at page 1021:

> A gene is a chemical compound, albeit a complex one, and ... conception of a chemical compound requires that the inventor be able to define it so as to distinguish it from other materials .... Conception does not occur unless one has a mental picture of the structure of the chemical or is able to define it by its method of preparation, its physical or chemical properties, or whatever characteristics sufficiently distinguish it. It is not sufficient to define it solely by it principal biological property, *e.g.*, encoding human erythropoietin, because an alleged conception having no more specificity than that is simply a wish to know the identity of any material with that biological property.

13. Claims 6-9, 11-14 and 16-23 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for *T. fusca* β-1,4-endoglucanse-encoding sequences and plants transformed with them, does not reasonably provide enablement for nucleic acids encoding all cellulases, plants transformed with those cellulases, or non-transformed plants that express cellulases. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention commensurate in scope with these claims.

The claims are broadly drawn to plants that express cellulases.

In contrast, the instant specification, however, only provides guidance for expression of constructs comprising a nucleic acid encoding the *T. fusca* E1, E2 or E5 β-1.4-endoglucanse operably linked to the tobacco PR-1a or the CaMV 35S promoter in tobacco, maize or wheat (example A) and similar expression in plants of constructs encoding fusion proteins of those endoglucanases and a vacuolar signal sequence (example B).

The instant specification fails to provide guidance for isolation of all cellulase DNAs, and hence for all plants comprising said DNAs.

As the specification does not describe the transformation of any plant with a gene encoding a cellulase other than the three *T. fusca* β-1,4-endoglucanse, undue trial and error experimentation would be required to screen through the myriad of nucleic acids encompassed by the claims and plants transformed therewith, to identify those that express cellulase, if such plants are even obtainable.

14. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

15. Claims 6-9 and 11-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter that Applicant regards as the invention. Dependent claims are included in all rejections.

Claim 6 is indefinite in its recitation of "cellulase". This term is used in the art to refer to a wide variety of cellulose degrading enzymes and it is not clear which of these are intended. In dependent claim 11, cellobiohydrolases (β-1.4-exoglucanses) and cellobioses (β-1.4-D-glucosidases) are listed separately from "cellulases" in the Markush groups, those enzymes were not considered cellulases for purposes of examination.

Claims 11-13 lack antecedent basis for the limitation "the cellulose-degrading enzyme". Dependent claims should be amended accordingly.

Claim 11 not written in proper Markush format. Because 'enzyme" is singular, all members of the groups should also be singular. See MPEP § 2173.05(h).

In claim 13, the word "preferably" renders the claim indefinite because it is unclear whether the limitation following the word is part of the claimed invention. See MPEP § 2173.05(d).

Regarding claim 18, the placement of words within parenthesis renders the claim indefinite because it is unclear whether the limitation(s) in parenthesis are part of the claimed invention. See MPEP § 2173.05(d).

Claims 19-20 are indefinite in their recitation of "targeting sequence". It is unclear if the targeting sequence is a protein attached to the heterologous DNA or if a nucleic acid encoding a targeting sequence is what is further comprised in the heterologous DNA.

It is not clear what is intended by the recitation of "thermostable" in claim 21, as all cellulases are stable at some temperature.

Claim Rejections - 35 USC § 102

16. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in-
> (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or
> (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

17. Claims 6-7, 11 and 17-23 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoshikawa et al (1993, Naturwissenschaften 80:417-420) in light of each of Takeuchi et al (1990, Plant Physiol. 93:673-682) and Melchers et al (1993, Plant Mol. Biol. 21:583-593).

Yoshikawa et al teach tobacco plants transformed with a nucleic acid encoding a soybean β-1,3-endoglucanse expressed behind the CaMV 35S promoter and seeds produced from those transformed plants, wherein the seeds comprise the nucleic acid (pg 417 and Figure 1). This cellulase would be "thermostable". Takeuchi et al teach that the soybean β-1,3-endoglucanse genes encodes a protein with a signal peptide (paragraph spanning pg 679-680); Melchers et al teach that β-1,3-endoglucanses are encoded with vacuolar targeting sequences. Thus, the plants of Yoshikawa et al comprise a heterologous DNA encoding a cellulase and a targeting sequence and under the control of a constitutive promoter.

18. Claims 6, 11, 18 and 21-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Lashbrook et al (1994, Plant cell 6:1485-1493).

Lashbrook et al teach that tomato plants express endo-β-1,4-glucanase at various times during fruit ripening (Figure 3); the fruit would inherently comprise seeds. This cellulase would be "thermostable"

19. Claims 6-7, 11-13, 18 and 21 are rejected under 35 U.S.C. 102(e) as being anticipated by Borriss et al (US Patent 5,470,725, filed February, 1990).

Borriss et al teach a nucleic acid encoding a thermostable β-(1,3-1,4)-endoglucanase constructed by hybridizing parts of β-glucanase genes from two different *Bacillus* species (column 3, lines 11-24). Borriss et al also teach plants transformed with the nucleic acid (claim

55). Because the plant is capable of expressing the nucleic acid (see parent claim 41), the nucleic acid would be operably linked to a promoter active in plants.

20. Claims 6-9, 11-13 and 18 23 are rejected under 35 U.S.C. 102(e) as being anticipated by Ryals et al (US Patent 5,614,395, filed January, 1993).

Ryals et al teach plants transformed with nucleic acids encoding a β-1,3-endoglucanases wherein the nucleic acid is expressed behind a PR-1a promoter (claims 7-8 and 10). The β-1,3-endoglucanase would be thermostable and would inherently comprise a vacuole targeting sequence. Ryals et al also teach seed from plants transformed with a construct comprising a promoter and a β-1,3-endoglucanase sequence, including seed comprising the construct (column 146, lines 6-25).

Claim Rejections - 35 USC § 103

21. The following is a quotation of 35 U.S.C. 103(a), which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

22. Claims 6-8, 11, 16-18 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bennett et al (1992, US Patent 5,168,064).

The claims are drawn to plants that express cellulase because they are transformed with a nucleic acid encoding endo-β-1,4-glucanase.

Bennett et al disclose a nucleic acid encoding a tomato endo-β-1,4-glucanase and plants transformed with antisense constructs comprising that nucleic acid expressed behind the

chemically inducible E8 promoter and the constitutive CaMV 35S promoter (column 17, line 9, to column, 21, line 49). The tomato endo-β-1,4-glucanse would be "thermostable." Bennett et al do not disclose plants transformed with the construct in a sense orientation.

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to modify the method of transforming plants with an antisense endo-β-1,4-glucanase-encoding construct as taught by Bennett et al, to express the endo-β-1,4-glucanase-encoding in a sense orientation. One of ordinary skill in the art would have been motivated to do so because of the suggestion of Bennett et al to do so (column 3, lines 23-25).

23. Claims 6-7, 11-15 and 17-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshikawa et al (*supra*) in view of Lao et al (1991, J. Bacteriol. 173:3397-3407).

The claims are drawn to plants transformed with a gene encoding a *T. fusca* endo-β-1,4-glucanase.

The teachings of Yoshikawa et al are discussed above. Yoshikawa et al do not disclose plants transformed with a nucleic acid encoding a *T. fusca* endo-β-1,4-glucanase.

Lao et al teach genes encoding the *T. fusca* E2 and E5 endo-β-1,4-glucanases.

At the time the invention was made, it would have been obvious to one of ordinary skill in the art to modify the method of making plants resistant to fungal diseases by transformation with an enzyme that attacks β-glucans as taught by Yoshikawa et al, to substitute the β-glucan degrading enzyme, β-1,4-glucanase, described in Lao et al. One of ordinary skill in the art would have been motivated to do so because substitution of one β-glucan degrading enzyme for another would be an obvious optimization of experimental parameters.

Conclusion

24. No claim is allowed.

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anne R. Kubelik, whose telephone number is (703) 308-5059. The examiner can normally be reached Monday through Friday, 8:30 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amy Nelson, can be reached at (703) 306-3218. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and (703) 872-9307 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the patent analyst, Kimberly Davis, at (703) 305-3015.

Anne R. Kubelik, Ph.D.
June 14, 2002

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